Assessing the Effectiveness of Your Municipal Stormwater Program

With
Karen Ashby, Larry Walker Associates
Betsy Elzufon, Larry Walker Associates
Nikos Singelis, U.S. EPA

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Topics:

- **Planning and Priority Setting for MS4s**
- **Key Elements for Effective Municipal Programs**
- **Measuring and Assessing MS4 Programs**
  - **California Stormwater Quality Association (CASQA)** *Municipal Stormwater Program Effectiveness Assessment Guidance*
- **Municipal Operations/Good Housekeeping Case Study**

Planning and Priority Setting

Know Your Watershed!

- Water Quality Standards/Designated Uses

- Existing impacts (impairments and TMDLs)

- Land uses, current and future

- Social factors

- Regulatory framework

- Drainage and flooding issues

Planning and Prioritizing

Local Stormwater Management Program

← **Planning and Priority Setting** →

Public Education	Public Involvement	Illicit Discharge	Construction	Post-Construction	Good Housekeeping

Planning/ Priority Setting   **Planning/ Priority Setting**   **Planning/ Priority Setting**   **Planning/ Priority Setting**   **Planning/ Priority Setting**

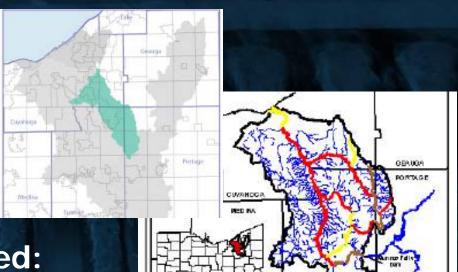# Planning Should Occur at Multiple Levels

- **Geographic Scales**
  - Local (stream, wetland, etc.)
  - Watershed (river, basin, etc.)
    - Ideally, shared goals and implementation plans with MS4s, watershed organizations, etc.
  - Regional
    - Ideally, shared goals and implementation plans with MS4s, watershed organizations, etc.

Stormwater Management Plan

- **Local plan will synthesize information from three levels, including:**
  - Pollutants
  - Hydrologic/Physical
  - Biological
  - Current and future land use
- **Consider sources**
- **Consider ability to affect change**
- **Develop a logical set of priorities and measurable goals to frame stormwater management plan**

Example: Northeast Ohio

Local:
Tinker's Creek

Watershed:
Cuyahoga
River

Regional: Lake Erie

Possible Priorities for NE Ohio

- **Local (Tinker's Creek)**
  - Organic enrichment/dissolved oxygen
    - Wastewater treatment plants

- **Watershed (Cuyahoga River)**
  - Nitrogen and Phosphorus
    - Urban stormwater, particularly lawn care
  - Bacteria
    - CSOs and Urban Stormwater

- **Regional (Lake Erie)**
  - Phosphorus
    - Agriculture
    - Urban stormwater
  - Bacteria
    - CSOs and Urban Stormwater

MS4 Stormwater Management Program
- Clear and logical priorities
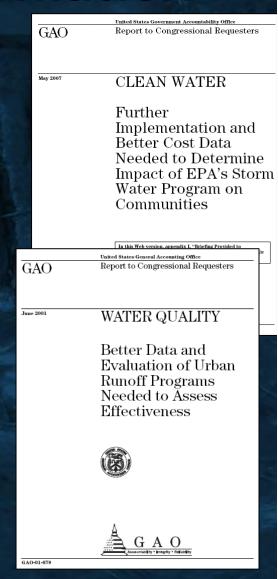- Measurable Goals
- Detailed action plans

EPA's Compliance Monitoring Strategy

Provides inspection frequency goals for all NPDES program, including stormwater:

- Phase I MS4s – Audit every Phase I MS4 within five years. Inspect as needed.

- Phase II MS4s – Audit and inspect every Phase II MS4 within seven years

- www.epa.gov/compliance/resources/policies/monitoring/cwa/npdescms.pdf

Congress identified the need for better effectiveness information

- GAO found that neither costs nor effectiveness of stormwater program has been determined
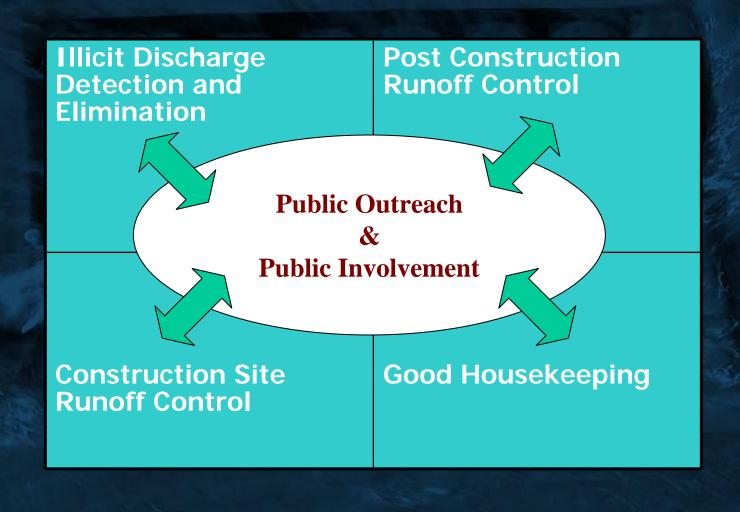- EPA must examine Phase II implementation starting in 2012

United States Government Accountability Office

GAO

Report to Congressional Requesters

May 2007

CLEAN WATER

Further Implementation and Better Cost Data Needed to Determine Impact of EPA's Storm Water Program on Communities

In this Web version, appendix I, "Briefing Provided to

United States General Accounting Office

GAO

Report to Congressional Requesters

June 2001

WATER QUALITY

Better Data and Evaluation of Urban Runoff Programs Needed to Assess Effectiveness

GAO

Accountability * Integrity * Reliability

GAO-01-679

Essential Elements of Successful MS4 Programs

Public Education and Involvement

- **EPA's *Getting In Step* manuals for outreach campaigns and stakeholder involvement**

- **More than just producing brochures!**

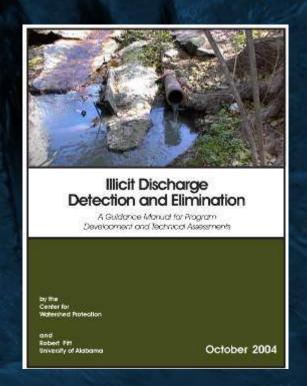# Public Education & Involvement

Public Ed. & Involvement Essentials

- **Using the *Getting In Step* method:**
  - Assessed knowledge and understanding
  - Developed priorities for outreach activities
  - Implemented at least one significant and sustained outreach campaign based on a pollutant of concern and designed to change behaviors
  - Implemented involvement activities, such as citizen's advisory committee, etc.

Eight Steps to Build an IDDE Program

Using the IDDE Manual:

- Audited Existing Resources & Programs

- Established Responsibility, Authority & Tracking

- Completed a Desktop Assessment of Illicit Discharge Potential

- Developed Program Goals & Implementation Strategies

- Searched for Illicit Discharge Problems in the Field

- Isolated & Fix Individual Discharges

- Prevented Illicit Discharges

- Evaluated the Program

Illicit Discharge
Detection and Elimination

A Guidance Manual for Program
Development and Technical Assessments

by the
Center for
Watershed Protection

and
Robert Pitt
University of Alabama

October 2004

IDDE: Key Elements

- **Ordinance**
  - **Prohibition on non-stormwater discharges**
  - **Ability to stop discharges/correct problems**
  - **Access**
  - **Fines and Penalties**
- **System map**
- **Assessment of sub-watershed potential**
- **Staff trained**
- **Tracking system**
- **Public education, e.g. hotline**
- **Address all obvious, flowing illicit discharges**

Construction Site Management

- **Manage runoff from construction sites disturbing 1 or more acres of land,** including smaller sites that are part of a larger, common plan of development

Construction: Key Elements
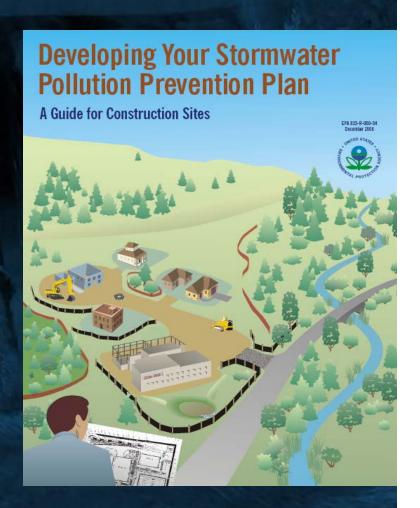
- **Ordinance in place**
  - **Sediment and erosion**
  - **Good housekeeping/ pollution prevention**
  - **Submit plans for review**
  - **Fines and penalties**

Not a SWPPP!

Construction: Key Elements

- **Plan review process**
  - Trained staff
  - Integrated with post-construction review
  - Consider public input

- **Inspection**
  - Inventory and tracking of sites
  - Ability to respond to citizen complaints
  - Schedules, routine vs. targeted

- **Education**
  - Builders and developers, citizens, staff

Developing Your Stormwater Pollution Prevention Plan

A Guide for Construction Sites

EPA 833-R-060-04
December 2006

Post-Construction

- **Develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects***
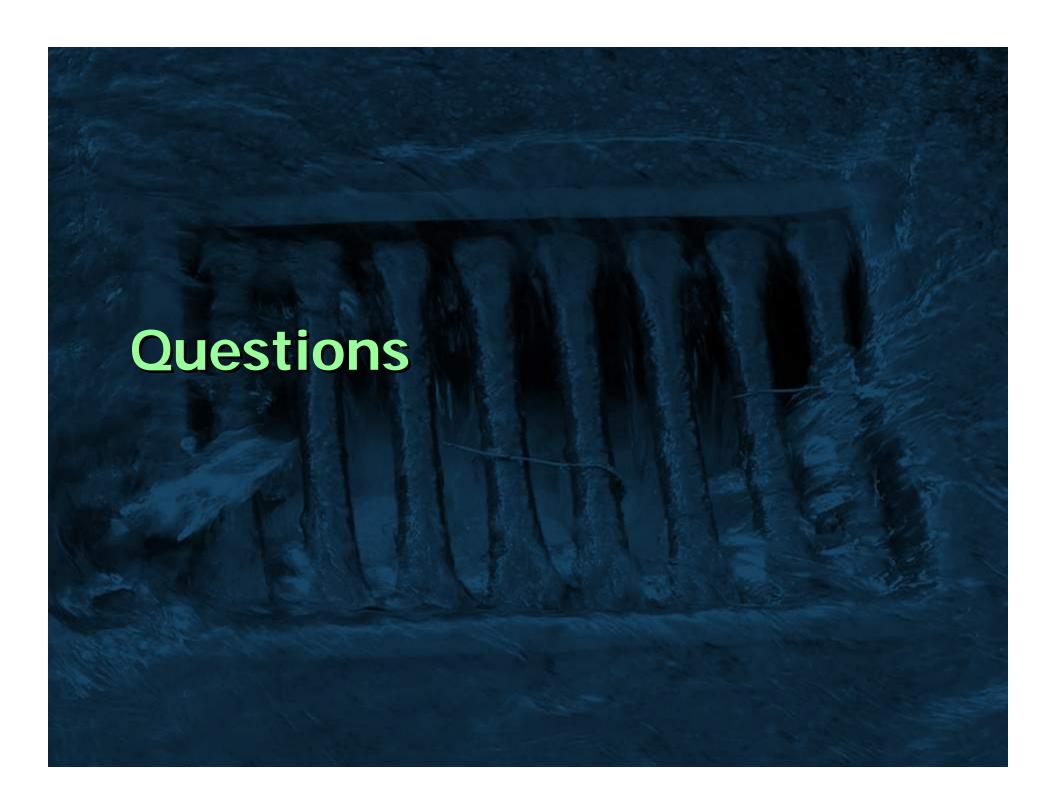

*that disturb one acre or more, including smaller projects that are part of a larger, common plan of development.

Post-Construction: Key Elements

- **Ordinance covering new development and redevelopment**
    - Requirements for plan review
    - Reference design criteria
    - Maintenance requirements
    - Fines and penalties
- **Developed or adapted design criteria, which include low impact BMPs**
- **Plan review process with trained staff**
- **Maintenance program**
- **Trained inspection staff**

Municipal Operations

- **Develop a program to prevent stormwater pollution from municipal operations**
  - Training for employees
  - Standard operating procedures
  - Covers parks, building and fleet maintenance, construction, roads, streets, parking lots, maintenance yards, waste transfer stations, etc.

Questions
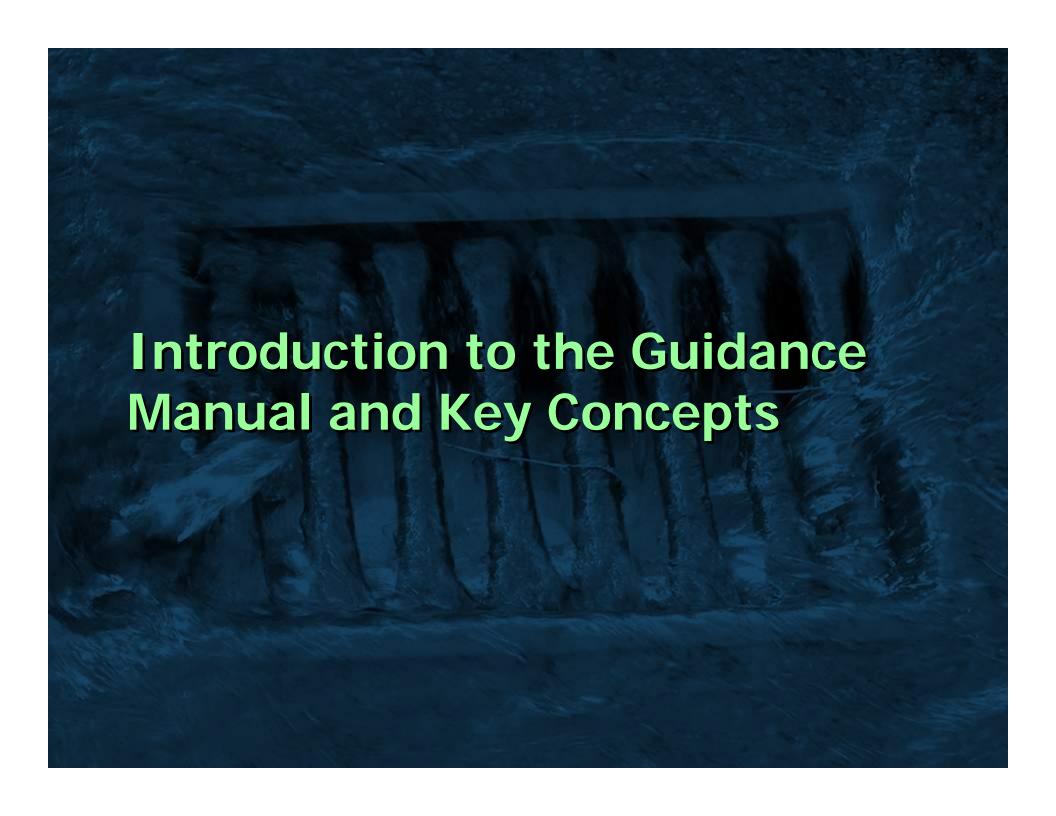
Introduction to CASQA
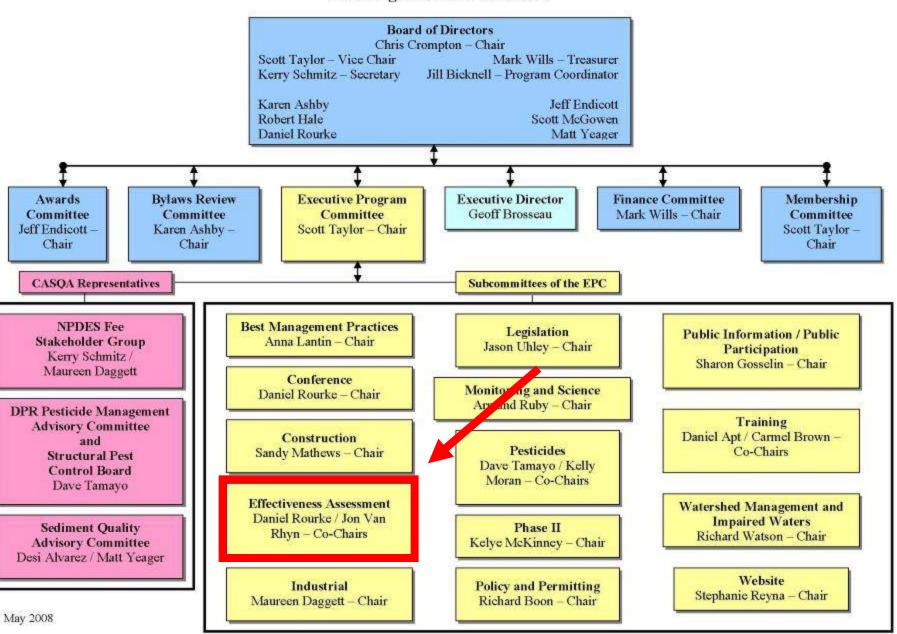
- **Formed in 1989 as the SWQTF**
- **Transitioned to CASQA in 2002**
- **CASQA is a 501(c)(3) non-profit**
- **Membership comprised of a diverse range of stormwater professionals**
- **Hold bi-monthly meetings and an annual conference**
- **Board of Directors and Executive Program Committee**

www.casqa.org

California Stormwater Quality Association (CASQA)
2008 Organizational Structure

Board of Directors
Chris Crompton – Chair
Scott Taylor – Vice Chair   Mark Wills – Treasurer
Kerry Schmitz – Secretary   Jill Bicknell – Program Coordinator

Karen Ashby   Jeff Endicott
Robert Hale   Scott McGowen
Daniel Rourke   Matt Yeager

Awards Committee
Jeff Endicott – Chair

Bylaws Review Committee
Karen Ashby – Chair

Executive Program Committee
Scott Taylor – Chair

Executive Director
Geoff Brosseau

Finance Committee
Mark Wills – Chair

Membership Committee
Scott Taylor – Chair

CASQA Representatives

Subcommittees of the EPC

NPDES Fee Stakeholder Group
Kerry Schmitz / Maureen Daggett

DPR Pesticide Management Advisory Committee and Structural Pest Control Board
Dave Tamayo

Sediment Quality Advisory Committee
Desi Alvarez / Matt Yeager

Best Management Practices
Anna Lantin – Chair

Conference
Daniel Rourke – Chair

Construction
Sandy Mathews – Chair

Effectiveness Assessment
Daniel Rourke / Jon Van Rhyn – Co-Chairs

Industrial
Maureen Daggett – Chair

Legislation
Jason Uhley – Chair

Monitoring and Science
Armand Ruby – Chair

Pesticides
Dave Tamayo / Kelly Moran – Co-Chairs

Phase II
Kelye McKinney – Chair

Policy and Permitting
Richard Boon – Chair

Public Information / Public Participation
Sharon Gosselin – Chair

Training
Daniel Apt / Carmel Brown – Co-Chairs

Watershed Management and Impaired Waters
Richard Watson – Chair

Website
Stephanie Reyna – Chair

May 2008

Introduction to the Guidance Manual and Key Concepts

History of Guidance Document

- Regulatory requirements in permits
- Municipalities unsure how to conduct these assessments
- CASQA identified a need for a guidance document – worked with committee
- Developed white paper and then guidance document
- Received regulatory support

White Paper ~ 2 Years → Guidance Document

Guidance Document Approach

- **Defines terms and key concepts**
- **Presents an assessment strategy**
- **Describes different assessment methods**
- **Identifies applicability to program elements/ minimum control measures**
- **Provides examples**

MAY 2007

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION

Municipal Stormwater Program Effectiveness Assessment Guidance

Industrial/ Commercial

Public Education

Municipal Operations

Illegal Discharges/ Illicit Connections

New Development

Construction

Why Conduct Effectiveness Assessments?

Use the Results to:

- **Determine if the program is progressing towards its intermediary and long term goals**

- **Determine if data is meaningful**

- **Focus/ modify the program**

- **Identify resource needs**

- **Meet permit requirements**

How Can We Adaptively Manage the Programs with Assessment?
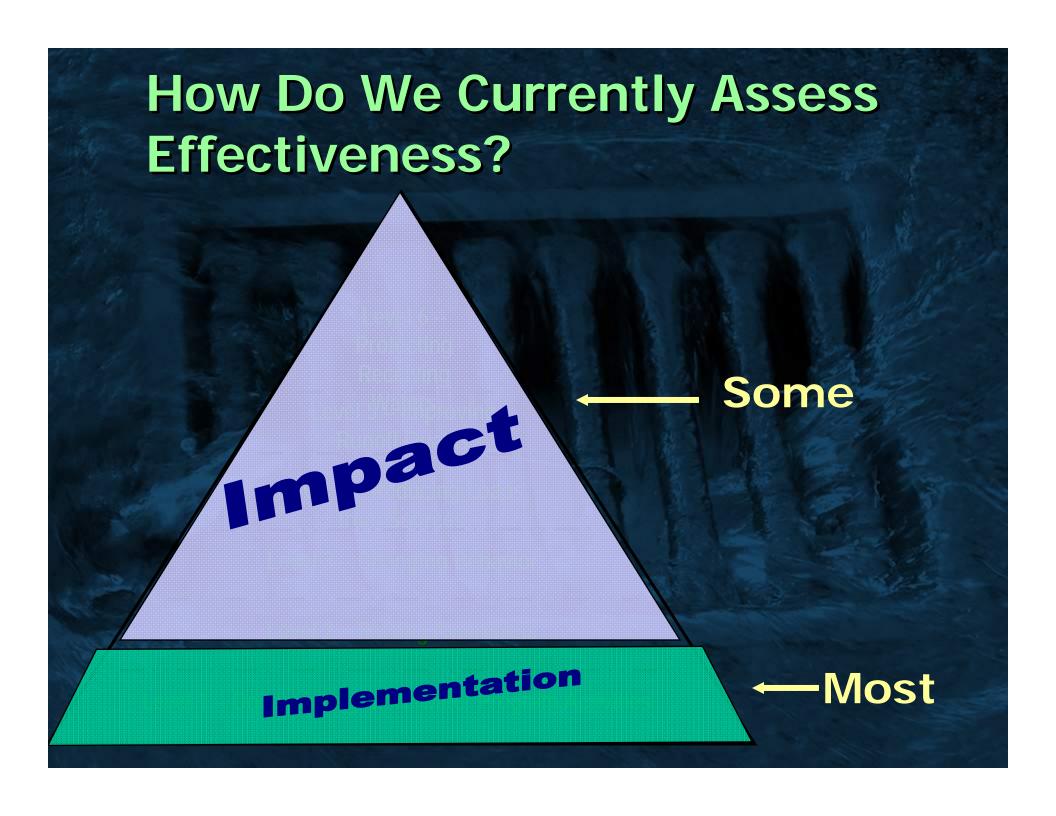
Where are We Now in Adaptively Managing the Programs?

How Do We Currently Assess Effectiveness?

Impact

Implementation

Some

Most

How Can We Assess Effectiveness?

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Program
(Levels 5-6)
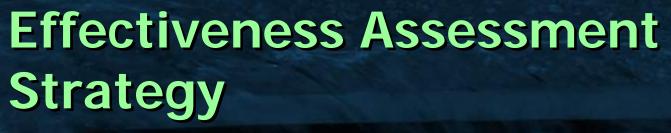
Element
(Levels 2-5)

Activity
(Levels 1-4)

Not All Outcome Levels Apply

Minimum Control Measure	Outcome Levels					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Public Education & Outreach	X	X	X			
Public Participation/ Involvement	X	X	X			
Illicit Discharge Detection and Elimination	X	X	X			
Construction Site Runoff	X	?	X	X		
Post-Construction Runoff Control	X	?	X	X		
Pollution Prevention/ Housekeeping	X	X	X	X		

Effectiveness Assessment Strategy

- **Determining Assessment Focus**
- **Determining Baseline Condition**
- **Selecting Assessment Method(s)**
- **Using the information**

Assessment Focus

- **Is the activity being implemented (Level 1)?**

- **Does the activity/element raise awareness (Level 2)?**

- **Does the activity/element change behavior (Level 3)?**

- **Does the activity/element reduce loads from sources (Level 4)?**

- **Does the element/program result in improved runoff quality (Level 5)?**

- **Has a measurable change been observed in receiving waters (Level 6)?**

Establishing Assessment Focus

- **What are you trying to achieve?**

  Goal

- **Where are you starting from?**

  Baseline

- **How will you know if the goal has been achieved?**
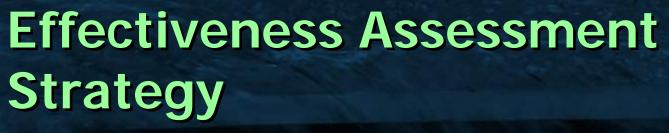
  Target

- **What is the desired outcome?**

  Outcome Level

Example Goals, Targets, and Outcome Levels
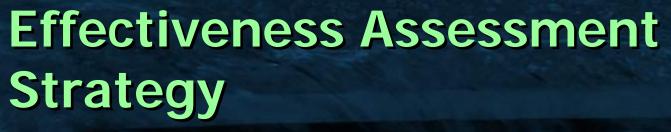
Goal	Target	Outcome Level
Increase the implementation of proper protocols for storm drain cleaning.	All storm drains are inspected and cleaned	1
Decrease chemical use for landscape maintenance.	Decrease pesticide use by 20% in targeted locations	3

Effectiveness Assessment Strategy

- **Determining Assessment Focus**
- **Determining Baseline Condition**
- **Selecting Assessment Method(s)**
- **Using the information**

Example Baseline Information

- **What have we done - what do we know?** (Level 1)

- **Is the target audience aware – did they change behavior?** (Level 2)

- **Can we use a past survey?** (Levels 2, 3)

- **Do we have baseline monitoring data?** (Levels 4, 5, 6)

Effectiveness Assessment Strategy

- **Determining Assessment Focus**
- **Determining Baseline Condition**
- **Selecting Assessment Method(s)**
- **Using the information**

Selecting Assessment Methods

- **Confirmation**

- **Tabulation**

- **Surveys**

- **Inspections/ Observation**

- **Quantification**

- **Monitoring**

Methods & Outcome Levels

Monitoring

Observation

Quantification

Inspections

Surveys

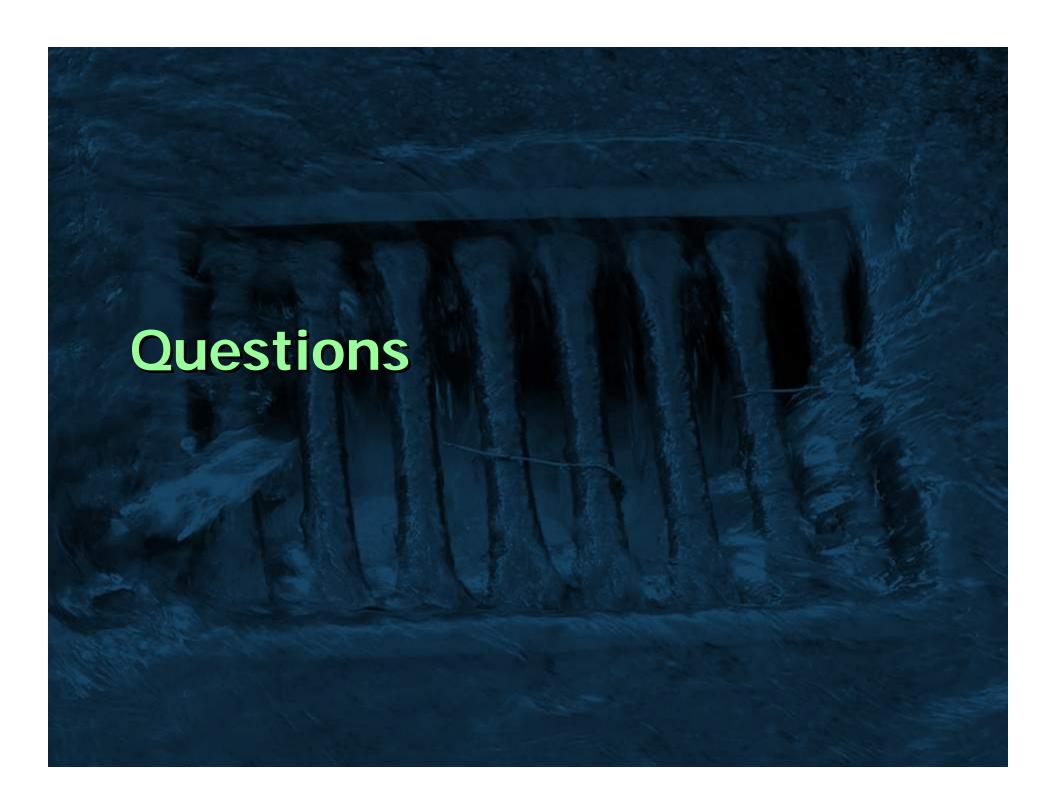**Tabulation**

Confirmation

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior
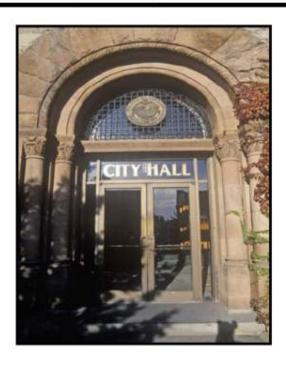
Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities
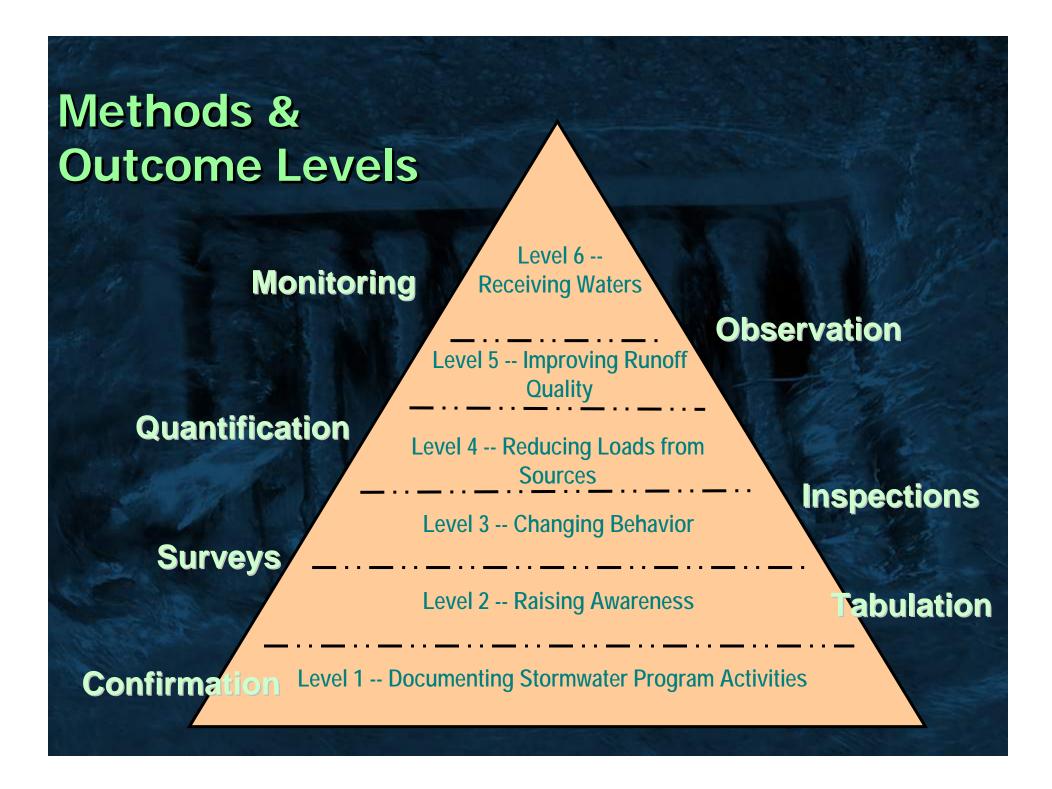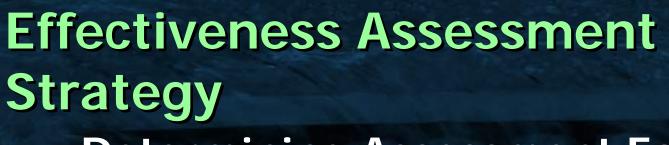
Example – Setting a target/ Selecting a method

- **Goal: Reduce pesticide use.**

Target	Data Collected	Assessment Method
Use protocols to reduce pesticide use by municipal staff by 50%	Pounds of pesticide active ingredient used	Tabulation Quantification
Conduct outreach to reduce pesticide use by residents by 10%	Reported Use Shelf survey, sales tracking	Surveys Tabulation

Effectiveness Assessment Strategy

- **Determining Assessment Focus**
- **Determining Baseline Condition**
- **Selecting Assessment Method(s)**
- **Using the information**

Using the information

- **Data analysis**

- **Future planning**
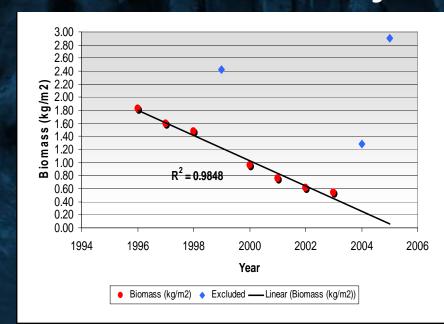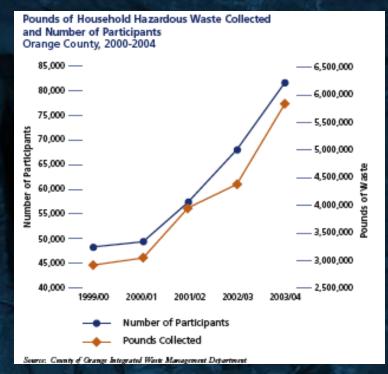
- **Reporting & communicating**

Using the information

- **Data analysis**
  - **Observed changes**
  - **Trends**
  - **Quantitative analysis**

Pounds of Household Hazardous Waste Collected and Number of Participants
Orange County, 2000-2004

Source: County of Orange Integrated Waste Management Department

Interpreting Data for Future Planning

- Theatre slides more effective than signs

- Relate message to wetlands

- Move from awareness to behavior change

Overall Program and Water Quality Assessment

Increasing Difficulty

Level 6 -- Protecting Receiving Waters

Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

?

Questions

Case Study –
How the Guidance Document Has Been Used Within California
for Municipal Operations/Good Housekeeping

Document Identifies How the Concepts Apply to Each Program Element/MCM

Municipal Operations Program Element

Applicable Outcome Levels	
Level 1 – Documenting Activities	X
Level 2 – Raising Awareness	X
Level 3 – Changing Behavior	X
Level 4 – Reducing Loads from Sources	X
Level 5 – Improving Runoff Quality	*
Level 6 – Protecting Receiving Water Quality	*

*Levels 5 & 6 discussed in Section 6

Identifies Example Goals Outcomes

Outcome Level	Goal	Example Outcomes
1 – Documenting Activities	Program development and implementation and basic compliance with the NPDES permit requirements.	• Perform street sweeping at a defined frequency and coverage • # of storm drain inlets cleaned • # of responses to complaints/ flood notifications
2 – Raising Awareness	Raise a target audience's awareness and understanding of an issue	• Develop a Facility Pollution Prevention Plan (FPPP) for Corporation Yard • % field maintenance staff who understood training concepts
3 – Changing Behavior	Change a target audience's behavior which results in the implementation of recommended BMPs	• Implementation of FPPP at corporation yard. • Proper handling and disposal of street sweeping waste.
4 – Reducing Loads from Sources	Reduce the load of pollutants from sources to the storm drain system	• Estimates of pounds of pollutant removed by cleaning of storm drain inlets and sumps • Tons of dry waste removed from street sweeping

Identifies Example Goals and Targets

Goals	Target	Projected Timeframe
Change a target audience's behavior which results in the implementation of recommended BMPs – Increase the implementation of proper protocols for storm drain cleaning.	All (or some feasible annual percentage) storm drains are inspected and cleaned consistent with prioritized schedule.	Within 2 years
Reduce the load of pollutants from sources to the storm drain system – Decrease chemical use for landscape maintenance.	Decrease pesticide use by 20% (taking in to account weather patterns and other factors) in targeted locations.	Within 3 years

Examples for Reporting

Task	Data Collected	Outcome Level	Assessment Method and Comparison with Goals and Baselines
Storm Drain System Maintenance			
Inventory drainage system (by drainage area or sub-watershed)	Develop inventory/map of drainage system. Identify the location and size of drainage system including catch basins, pump stations, detention basins, etc.	1	Confirmation • Identify that the inventory was developed Tabulation • Identify total # catch basins and number directly draining to receiving water • Provide map of drainage system
	Compile cleaning records for drainage system	1	
Develop and implement cleaning schedule and protocols	Develop protocols for cleaning	1-2	Confirmation • Identify that protocols were developed Tabulation/Quantification • # cleaned and estimate of waste removed.
	Number of catch basins, drain pipe, pump stations, etc. cleaned	2 – 4	

Some MS4s Are Already Using the Guidance Document

City and County of San Diego

Some Phase II MS4s

Outcome Levels and the SWMP

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Is the activity being implemented?

Examples – Outcome Level 1

- Stenciled/marked catch basins
- Developed inspection forms
- Prioritized catch basins
- Annually inspected and cleaned catch basins

Source Type	Activity	Targeted Outcome	Measures of Success			
			Target	Actual	% Completion	Completion (Yes / No)
1. Roads, Streets, Highways, and Bridges	Inventory update	Task completion	- - -	- - -	- - -	Yes
2. MS4	Inventory conversion to GIS	Conversion of culverts (multi-year target)	100%	95%	- - -	- - -
3. Fixed Municipal Facilities	Inventory update	Task completion	- - -	- - -	- - -	Yes
4. Roads, Streets, and Highways	Sweeping	Streets swept (miles)	11,354	14,615	129%	- - -
5. MS4	Cleaning	Conveyances cleaned	15,540	16,402	106%	- - -
6. MS4	Stenciling	Inlets stenciled	137	137	100%	- - -
7. Municipal Employees	Basic Awareness Training	Employees trained	3,400	>18,000	100%	- - -
8. Municipal Employees	Focused Training	Employees trained	1,170	1,046	90%	- - -

Outcome Levels and the SWMP

Does the activity/element raise awareness?

Level 6 -- Receiving Waters
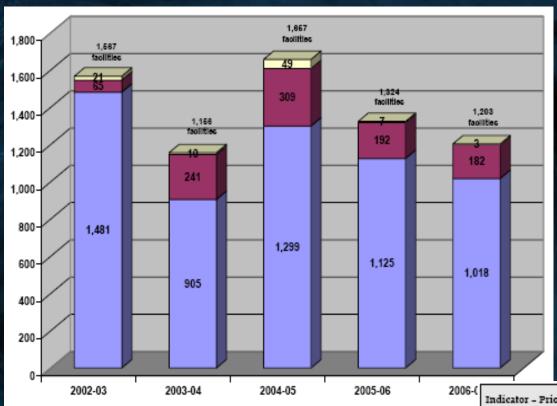
Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Example – Outcome Level 2

- **Primarily achieved with training**
- **Recognize that Level 3 supports if Level 2 is achieved**

Model IPM and Fertilizer Guidelines	Effectiveness Assessment Outcome Levels					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
	Implement Program	Increase Awareness	Behavior Change	Load Reduction	Runoff Quality	Receiving Water Quality
Model IPM	✓ Formal Policy		✓Reduction in pesticide use			
Fertilizer Guidelines	P Formal Policy		✓Reduction in fertilizer use			
Training	✓ Track number/type of training sessions	P Surveys show improved knowledge				

Key:

✓ = Currently Achieved Outcome Level

P = Potentially Achievable Outcome Level

Outcome Levels and the SWMP

Does the activity/element change behavior?

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality

Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Example – Outcome Level 3

Evaluate BMP implementation at facilities

Indicator – Prioritization of Facilities: For 2006-07 1,654 municipal facilities were prioritized, 25% of which were high priority In 2005-06 1,711 municipal facilities were prioritized, 27% of which were high priority; for 2004-05, 1,633 facilities were prioritized, 25% of which were ranked as high priority; for 2003-04, 1,749 facilities were prioritized, 29% of which were ranked as high priority; and for 2002-03, 1,711 facilities were prioritized, 26% of which were ranked as high priority (**Table C-5.1 and Figure C-5.1**).

☒ Level 1: Documenting Stormwater Program Activities

☒ Level 3: Changing Behavior

Outcome Levels and the SWMP

Does the activity/element reduce loads from sources?

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality
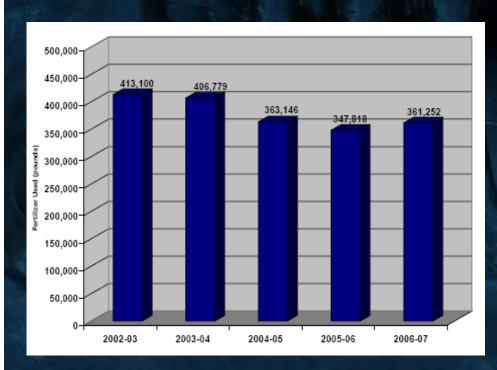
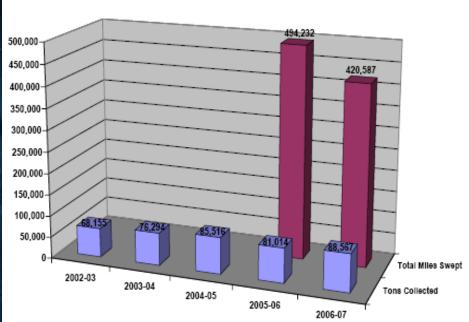Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Example – Outcome Level 4

- **Fertilizer Application**
- **Street Sweeping**

Outcome Levels and the SWMP

Has a measurable change been observed in receiving waters?

Does the element/program result in improved runoff quality?

Level 6 -- Receiving Waters

Level 5 -- Improving Runoff Quality

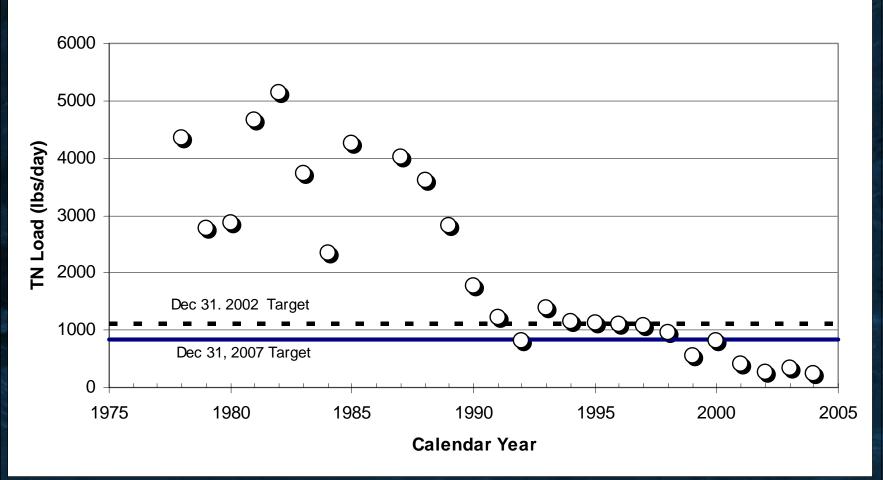Level 4 -- Reducing Loads from Sources

Level 3 -- Changing Behavior

Level 2 -- Raising Awareness

Level 1 -- Documenting Stormwater Program Activities

Example – Outcome Level 6 Newport Bay Nutrient Reduction

Average Summertime TN Load from San Diego Creek

Visual Progress (Site 7)

1997

2007

Using the Information

4.13 Municipal Operations Program Modifications

The City evaluates the results of the annual progress report assessments as well as the experience that staff has had in implementing the program and determines if any program modifications are necessary in order to comply with Clean Water Act requirements to reduce the discharge of pollutants to the maximum extent practicable.

At this time, no major modifications are anticipated for the Municipal Operations Program during the next fiscal year.

Proposed Program Modification (in ROWD):

- Develop Model Integrated Pest Management, Pesticide and Fertilizer Guidelines into a Model Program (rather than guidelines) with implementation goals and including model contract language.
- Redefine IPM (pesticide use) indicators.

In Summary….

- **Guidance Document is one approach for demonstrating effectiveness**
- **Assists in completing the iterative process**
- **Evaluates activities <u>and</u> impacts of program**
- **Can demonstrate intermediary progress towards program goals**
- **Approach is still evolving – stay tuned**

CASQA Guidance Manual

MAY 2007

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION

Municipal Stormwater Program
Effectiveness Assessment Guidance

Industrial/
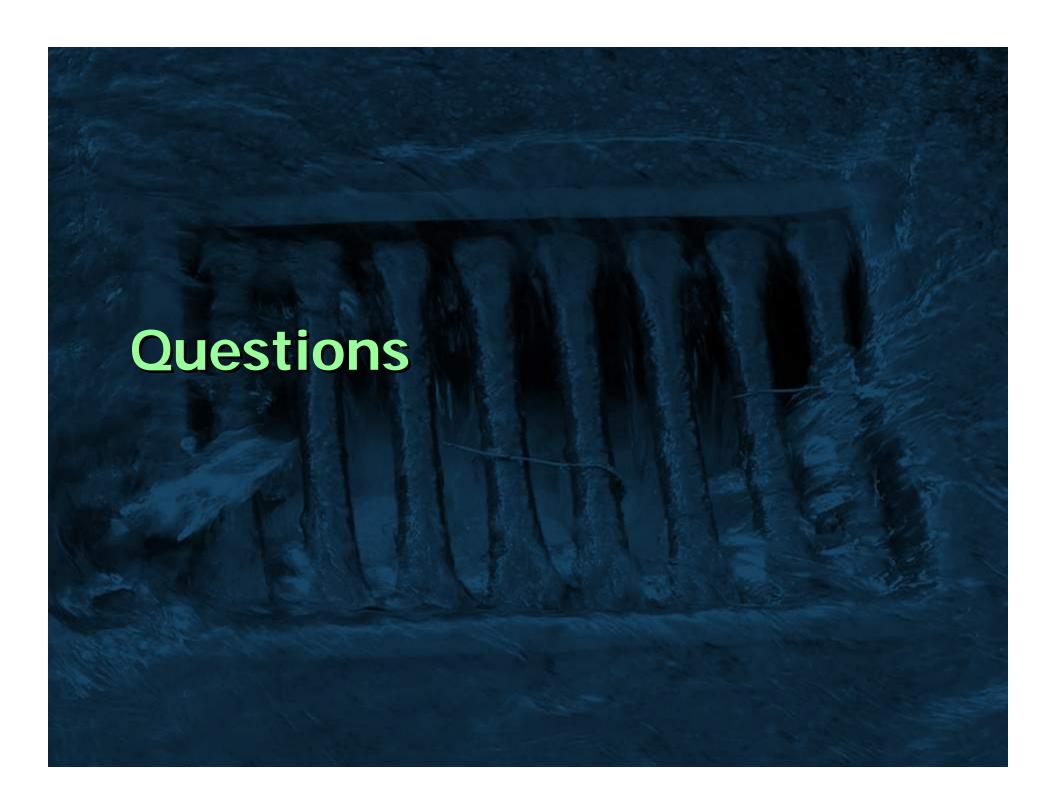Commercial

Public Education

Municipal
Operations

Illegal Discharges/
Illicit Connections

New Development

Construction

For More Information:

www.casqa.org

Questions

Next Stormwater Webcast

Stormwater 101

July 23, 2008 12:00 – 2:00 Eastern

Participation Certificate

- **If you would like to obtain participation certificates for multiple attendees, click the link below**

- **You can type each of the attendees names in and print the certificates**

www.epa.gov/npdes/webcasts/certificate/effective_municipal.pdf